Internal versus External Ramps
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Summary
This note describes the differences between internal and external ramps and discusses exposure compensation.

What is a Ramp?
A “ramp” is a controlled change of the camera’s frame rate (fps), performed while the camera is running. Please note that switching between the NORM and PS/CCU speed setting on the new cameras, or between crystal and variable speeds on a 35-3, are considered wild speed changes and thus not ramps.

Ramps can be used for a myriad of effects, from the dramatic speeding up or slowing down of the action to the subtle enhancing of a scene’s timing. A ramp essentially allows the compression or stretching of time, transparently and dynamically.

The frame rate of the new generation of Arriflex cameras can be changed with the following accessories: RU-1 (Remote Unit), RCU-1 (Remote Control Unit), CCU-1 (Camera Control Unit), LCC (Laptop Camera Controller) or RPC (Ramp Preview Controller).

Ramps come in two flavors: internal ramps and external ramps.

What is an Internal Ramp?
An internal ramp is a speed change that is stored in the camera’s internal memory. Internal ramps are possible with the 535, 535B, 435 and 435ES. The CCU, LCC or RPC are necessary to create an internal ramp and to send it to the camera. Once an internal ramp is stored in the camera, it can be activated and executed on the camera without any external controllers.

What is an External Ramp?
An external ramp is a speed change that is stored in an external camera controller like the RPC, LCC or RCU. To activate and execute an external ramp, the controller has to be connected to the camera. Since external controllers can have more memory and processing power than the camera, more complex ramps are possible.

Details on Internal Ramps
For the 535 and 435ES an internal ramp consists of a first speed and shutter pair, a second speed and shutter pair and a duration. For the 535B and 435 (non ES) an internal ramp consists of a first speed, a second speed and a duration. The duration is the time it will take to get from the first speed to the second speed.

Speed (fps) values can be entered with a resolution of 1/100th of a frame per second (i.e. 29.97 fps).

Before the camera is started, internal ramps need to be activated. This is generally done by pushing the PROG button on the camera or by putting the RPC in RAMP mode or by selecting the ramp from the Programs menu of the LCC. Once the camera is running, you can trigger the speed change by pushing the PROG button on the camera again or with the Ramp Trigger button on the RPC or LCC. Pushing either of those buttons again will bring the camera back to the first speed and so on.

Pushing the PROG button on the camera while the camera is in standby will de-activate any active internal ramp.

Details on External Ramps and the RCU
The RCU uses external ramps. It cannot modify the internal ramp values stored in the camera’s memory. Depending on the selection switch of the RCU, an external ramp can contain a speed change or a speed and shutter change.

The RCU will display the screentime of a ramp. When programming a speed and shutter change, the RCU will always assign a 180° mirror shutter to the higher fps value entered, and calculate the other shutter value based on the resulting exposure time.

Speed (fps) values can be entered with a resolution of 1/1000th of a frame per second (i.e. 23.976 fps).

Details on External Ramps and the RPC and LCC

An external ramp created with the RPC or LCC can have more than a first and a second speed/shutter pair. In fact, there can be an unlimited number of pairs. Thus the camera could start at 24 fps, then change to 12 fps, then change to 6 fps, etc.

The RPC and LCC can calculate shutter values automatically, or accept shutter values entered manually. This allows for effects like fade-ins or fade-outs.

Speed (fps) values can be entered with a resolution of 1/1000th of a frame per second (i.e. 23.976 fps).

Exposure Compensation

As you change the frame rate the exposure for each frame also changes. To keep the exposure constant during a ramp, some form of exposure compensation has to occur. Even though this Technical Note concerns itself less with exposure compensation, and more with the different ways to affect a change in speed, a brief discussion of exposure compensation is provided here:

The 535 and 435ES can compensate by varying the open angle of the mirror shutter while the camera is running. This is called a speed/shutter ramp.

On all new generation Arriflex cameras (535, 535B, 435, 435ES and 16SR 3), as well as on the 16SR and 35-3 type cameras, the Iris Control Unit (ICU) can also be used to compensate for the exposure change. The ICU will slave to the speed of the camera and vary the lens iris opening accordingly. This is called a speed/iris ramp.

Please note that compensating for the exposure change with either method has certain advantages and disadvantages:

Strobing	When compensating with the electronic mirror shutter, there is the danger of picking up a strobing effect during a fast pan while the mirror shutter is set to a small angle.
Depth of Field	When compensating by changing the lens iris with the ICU, the depth of field will change. The depth of field will not change when compensating with the electronic shutter of the 535 or 435ES.

For special effects, it is of course also possible to run a speed ramp without any exposure compensation.

What Controller Does What - A Summary

The CCU can create and control only internal ramps.

The RCU can create and control only external ramps.

The LCC can create and control internal as well as external ramps.

The RPC can create and control internal as well as external ramps.

For more information on this issue, please contact Marc Shipman-Mueller at
Voice: 773-252-8003, FAX: 773-252-5210, email: MSMueller@arri.com,
or your local ARRI representative.